MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

BMF1014 – MATHEMATICS FOR FINANCE

(All sections / Groups)

27 OCTOBER 2018
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of FIVE (5) pages excluding the cover page.
2. Answer ALL questions. The distribution of the marks is given for all questions.
3. Write all your answers in the Answer Booklet provided.
4. Only NON-PROGRAMMABLE calculators are allowed.
5. Selected mathematical formula are provided at the end of the question paper.

MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

BMF1014 – MATHEMATICS FOR FINANCE

(All sections / Groups)

27 OCTOBER 2018
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of FIVE (5) pages excluding the cover page.
2. Answer ALL questions. The distribution of the marks is given for all questions.
3. Write all your answers in the Answer Booklet provided.
4. Only NON-PROGRAMMABLE calculators are allowed.
5. Selected mathematical formula are provided at the end of the question paper.

Question 1 (25 Marks)

a) Find an equation of the line that passes through the point (6,10) and is perpendicular to the line $5x-4y-17=0$.

(7 marks)

b) An office file cabinet with a purchase price of RM1600 is linearly depreciated to the value of RM160 after 5 years.

i) What is the rate of depreciation of the cabinet? **(3 marks)**

ii) Find an expression for the cabinet's book value at the end of t years. **(3 marks)**

iii) What will be the book value of the cabinet at the end of the third year? **(3 marks)**

c) A manufacturing company produces and sells tables. The cost function is given by $C(x)=990+2x$ where x is the number of tables produced. The tables are sold for \$200 each.

Find:

i) the total cost of producing 25 tables. **(2 marks)**

ii) the revenue function. **(2 marks)**

iii) the profit function. **(2 marks)**

iv) the break-even quantity. **(3 marks)**

Question 2 (25 Marks)

a) Given $4\begin{bmatrix}1 & x\\ x & 1\end{bmatrix}+2\begin{bmatrix}2 & 0\\ y & z\end{bmatrix}=\begin{bmatrix}8 & 4\\ 8 & 10\end{bmatrix}$, find x, y and z. **(5 marks)**

Continued...

b) Reduce the given augmented matrix using the Gauss-Jordan Elimination Method.

$$\left[\begin{array}{ccc|c} 1 & -2 & -3 & 1 \\ 2 & 1 & 1 & 1 \\ 3 & 2 & 4 & 5 \end{array}\right]$$

(9 marks)

c) Using the method of inverse, solve the system:

$$\begin{cases} 3x-2y+z=-1 \\ 2x-y-z=5 \\ 2x+3z=4 \end{cases}$$

Show your all solution including the determinant, minor, cofactor and inverse matrix.

(11 marks)

Question 3 (25 Marks)

a) If you deposit RM6,000 into an account paying 6% annual interest compounded semiannually, how much money will be in the account after 6 years?

(5 marks)

b) An insurance company promises to pay John RM500 at the end of each month for the next six years due to his recent car accident. How much money should the insurance company invest now at 4.5%, compounded monthly, to guarantee that all the payments can be made?

(5 marks)

c) Find the amount of each quarterly payment to be made into a sinking fund to accumulate $140,000 in 12 years at 6% interest per year compounded quarterly.

(5 marks)

d) Suppose that $C(x)=0.006x^3-1.3x^2+60x+10400$ is a cost function, where c is the total cost in dollars of producing x units of a product. Find the marginal cost when $x=20$.

(4 marks)

Continued...

e) The total revenue (in dollars) for selling a product is given by $R(x) = 200x - 0.5x^2$ where x is the number of units sold per day.

i) Find the number of units that must be sold to maximize revenue. **(5 marks)**

ii) What is the maximum revenue? **(1 mark)**

Question 4 (25 Marks)

a) Given, $f(x, y) = 3y^2 - 2xy + x^2 - 2y + x - 7$.

i) Find $f_x(x, y)$ and $f_y(x, y)$. **(4 marks)**

ii) Find the critical point. **(5 marks)**

iii) Determine the nature of the critical point whether it is a relative maximum point, relative minimum point or neither both. **(6 marks)**

b) Integrate the following functions:

i) $\int \frac{5x^2 - 10x + 3}{x} dx$ **(3 marks)**

ii) $\int_0^1 15x^4 \left(3x^5 + 3\right)^5 dx$ **(7 marks)**

End of Page.

Formula

1. Quadratic Formula

The solution of the equation: $ax^2 + bx + c = 0$ where $a \neq 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

2. Mathematics of Finance

a) Simple interest

i) Interest, I = Prt

ii) Accumulated amount, A = P(1 + rt)

Where P = principal amount, r = interest rate, t = number of years

b) Effective rate of interest, $r_{eff} = \left[1 + \frac{r}{m}\right]^m - 1$

c) Compound interest

i) Accumulated amount, $A = P(1+i)^n$

ii) Present value, $P = A(1+i)^{-n}$

where $i = \frac{r}{m}$, and $n = mt$ and m = number of conversion periods per year

d) Future value of an annuity, $S = R\left[\frac{(1+i)^n - 1}{i}\right]$

e) Present value of an annuity, $P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$

f) Sinking fund, $R = \frac{Si}{(1+i)^n - 1}$

g) Amortization, $R = \frac{Pi}{1-(1+i)^{-n}}$

3. Rules of Differentiation

(a) Derivative of a constant: If $f(x)$ is a constant, then $f'(x) = 0$

(b) Power rule : If $f(x)$ is x^n, then $f'(x) = nx^{n-1}$

(c) Constant multiple rule: $\frac{d}{dx}[cf(x)] = cf'(x)$ (c is a constant)

(d) Sum rule: $\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$

(e) Product rule: If $f(x) = u(x) \cdot v(x)$, then $f'(x) = u(x)v'(x) + v(x)u'(x)$

(f) Quotient rule: $f'(x)=\frac{d}{dx}\left[\frac{u(x)}{v(x)}\right]=\frac{v(x)u'(x)-u(x)v'(x)}{[V(x)]^2}$

(g) Chain rule: $\frac{d}{dx}\{g[f(x)]\}=g'[f(x)]f'(x)$

(h) General power rule: $\frac{d}{dx}[f(x)]^n=n[f(x)]^{n-1}f'(x)$

(i) Exponential function: $\frac{d}{dx}(e^u)=e^u[u'(x)]$

(j) Logarithmic function: $\frac{d}{dx}(\ln u)=\left(\frac{1}{u}\right)[u'(x)]$

4. Rules of Integration

(a) Indefinite integral of a constant: $\int k\ du=ku+C$

(b) Power rule: $\int u^n du=\frac{u^{n+1}}{n+1}+C$

(c) Constant multiple rule: $\int kf(u)\ du=k\int f(u)\ du$ where k is a constant

(d) Sum rule: $\int[f(u)\pm g(u)]\ du=\int f(u)du+\int g(u)du$

(e) Exponential function: $\int e^u du=e^u+C$

(f) Logarithmic function: $\int\left(\frac{1}{u}\right)du=\ln u+C$

(g) Integration by parts : $\int U\,dV=UV-\int V\,dU$

5. Determining Relative Extremas

$D(x,y)=f_{xx}f_{yy}-(f_{xy})^2$

If D > 0 and f_{xx} > 0, relative minimum point occurs at (x, y).
If D > 0 and f_{xx} < 0, relative maximum point occurs at (x, y).
If D < 0, (x, y) is neither maximum nor minimum.
If D = 0, the test is inconclusive.